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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/043,896	01/09/2002	Kevin K. Lee	113025-120US2	7745

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EXAMINER
WANG, GEORGE Y

ART UNIT	PAPER NUMBER
2882	

DATE MAILED: 03/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/043,896	LEE ET AL.	
	Examiner	Art Unit	
	George Y. Wang	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-42 is/are pending in the application.

4a) Of the above claim(s) 28-35 and 39 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-27,36-38 and 40-42 is/are rejected.

7)☒ Claim(s) 11,13,26 and 42 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 05 April 2002 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 6 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

   I. Claims 1-27, 36-38, and 40-42, drawn to an optical chip, classified in class 385, subclass 28.

   II. Claims 28-32, drawn to an optical chip, classified in class 385, subclass 39.

   III. Claims 33-35 and 39, drawn to a substrate, classified in class 438, subclass 6

2. The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case, although both are optical chips, the invention of Group I serves to facilitate optical coupling by means of waveguide properties whereas the invention of Group II achieves this same coupling purpose by means of including a variety of optical functions for enhancing low-loss coupling. It would be recognizable to one of ordinary skill that these would be used together, as one would be preferred over the other, and that have different modes of operation.

Inventions I and III are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because the optical chip serves a variety of function that include optical coupling and mode enhancement. The subcombination has separate utility such as in semiconductor interconnection, switching, and a variety of opto-electro applications.

3. During a telephone conversation with Joseph Haag on 04 March 2003 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-27, 36-38, and 40-42. Affirmation of this election must be made by applicant in replying to this Office action. Claims 28-35 and 39 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

4. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Drawings

5. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

6. The term "similar" in claims 11 and 13 is a relative term which renders the claim indefinite. The term "similar" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Appropriate correction is required.

7. Claim 26 is objected to because of the following informalities: It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. Ex parte Masham, 2 USPQ2d 1647 (1987). Appropriate correction is required.

8. Claim 42 is objected to because it has been held that an element is "adapted to" perform a function is not a positive limitation but only requires the ability to do so. It,

therefore, does not constitute a limitation in any patentable sense. In re Hutchinson, 69 USPQ 138. Appropriate correction is required.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 1-4, 14-16, 29, 36, and 40-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admission of Prior Art (AAPA) in view of Wojnarowski et al. (U.S. Patent No. 5,737,458, from hereinafter "Wojnarowski").

11. As to claim 1, AAPA discloses an optical chip (pg. 1, lines 17-18) having at least one large mode field size dielectric waveguide (fig. 1; pg. 1, lines 17-18) that interfaces with an external optical device (pg. 1, lines 20-22), at least one low minimum bending radius dielectric waveguide (pg. 2, lines 15-17), and at least one optical function (pg. 1, lines 17-18) connected to the low minimum bending radius dielectric waveguide.

However, AAPA fails to disclose the large mode field size dielectric waveguide, the low minimum bending radius dielectric waveguide, and the optical function being fabricated monolithically on a single substrate.

Wojnarowski discloses an optical chip with dielectric waveguides (col. 2, lines 14-16) and optical function devices (fig. 2, ref. 50, 52) are fabricated monolithically on a single substrate (fig. 2, ref. 54).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to arrange a large mode field size dielectric waveguide, a low minimum bending radius dielectric waveguide, and an optical function monolithically on a single substrate since one would be motivated to provide an optimum platform for a high density interconnect structure (col. 1, lines 20-35). This not only provides stability but also high compatibility with many other interconnections, including external waveguides and optical devices (col. 2, lines 61-67).

12. Regarding claims 2-4 and 14-16, AAPA discloses an external optical device that is a low index difference dielectric waveguide, which is edge emitting/receiving, and provides input from an external optical chip (pg. 1, lines 20-22; fig. 1). Furthermore,

AAPA discloses this large mode field size dielectric waveguide, which is also a low index difference dielectric waveguide, having a low index core and cladding that are related by the following expression: $1<([n_1-n_3]/n_3)<0.1$ (fig. 1; pg. 1, line 22 – pg. 2, line 14). AAPA also discloses the low minimum bending radius dielectric waveguide, which is a high index difference dielectric waveguide, having a high index core and cladding that are related by the following expression: $0.1\leq([n_2-n_3]/n_3)$ (pg. 2, lines 15-24).

13. Regarding claims 17-19, AAPA discloses a large mode field size dielectric waveguide having a low index core and cladding that are related by the following expression: $1<([n_1-n_3]/n_3)<0.1$ (fig. 1; pg. 1, line 22 – pg. 2, line 14) and a low minimum bending radius dielectric waveguide i having a high index core and cladding that are related by the following expression: $0.1\leq([n_2-n_3]/n_3)$ (pg. 2, lines 15-24).

However, AAPA fails to disclose a large mode field size dielectric waveguide having a low index core and cladding that are related by the following expression: $0<([n_1-n_3]/n_3)<0.04$ or $0<([n_1-n_3]/n_3)<0.01$ and a low minimum bending radius dielectric waveguide having a high index core and cladding that are related by the following expression: $0.3\leq([n_2-n_3]/n_3)$.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have set the following core and cladding relationships expressed by: $0<([n_1-n_3]/n_3)<0.04$, $0<([n_1-n_3]/n_3)<0.01$, and $0.3\leq([n_2-n_3]/n_3)$. Since AAPA is clear to disclose that there is possible to be in the ranges as recited above (pg. 1, lines 28-30) and since AAPA does not specify any added advantages to have core-cladding

relationships expressed within the constraints of these expressions, one of ordinary skill in the art would recognize that the motivation to conform to these expression is a matter of design preference and need-based optical applications.

14. As per claim 27, AAPA discloses an optical function device, however, AAPA fails to specifically disclose the optical function device as any structure that performs at least one of generating, modifying, and measuring at least on of the amplitude, frequency, wavelength, dispersion, timing, propagation direction, and polarization properties of one or more light pulses.

Wojnarowski discloses an optical chip with an optical function device (fig. 7, ref. 50, 52) that performs at least one of generating, modifying, and measuring at least on of the amplitude, frequency, wavelength, dispersion, timing, propagation direction, and polarization properties of one or more light pulses (col. 6, lines 58-65).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to an optical function device that performs at least one of generating, modifying, and measuring at least on of the amplitude, frequency, wavelength, dispersion, timing, propagation direction,, and polarization properties of one or more light pulses since one would be motivated to achieve any of these functions on an optical chip. One of ordinary skill in the art would recognize these functions as well known and defined on the basis of performance and function needs.

15. As to claim 36 and 40-42, AAPA discloses the optical chip as recited above with a second chip including an emitting/receiving optical device, which may also be an external large mode field size dielectric waveguide, to optically connect to the large mode size dielectric waveguide of the first chip (pg. 1, lines 20-22).

16. Claims 5-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA and Wojnarowski, in view of Hammer (U.S. Patent No. 4,776,720).

AAPA and Wojnarowski disclose the optical chip as recited above with waveguide coupling devices (fig. 7, ref. 72, 74).

However, the references fail to specifically disclose a coupler that couples the low minimum bending radius dielectric waveguide to the large mode field size dielectric waveguide, and which has a first dielectric channel waveguide including a first core material having a first tapered region surrounded by a cladding material, a second dielectric channel waveguide including a second core material having a second tapered region surrounded by the cladding material such that all of the second tapered region being completely embedded within the first tapered region, where a first mode for propagating lightwaves defined by the first dielectric channel waveguide gradually transforms into a second mode defined by the second dielectric channel waveguide. Furthermore, the references fail to teach that the first and second tapered region narrow toward each other and are graded in the horizontal and vertical directions.

Hammer discloses an optical waveguide coupler (fig. 1, ref. 10) that includes a first core material (fig. 1, ref. 18) having a first tapered region (fig. 1, ref. 18a)

surrounded by a cladding material (fig. 1, ref. 16), a second dielectric channel waveguide including a second core material (fig. 1, ref. 20) having a second tapered region (fig. 1, ref. 20a) surrounded by the cladding material such that all of the second tapered region being completely embedded within the first tapered region (fig. 1, ref. 22), where a first mode for propagating lightwaves defined by the first dielectric channel waveguide gradually transforms into a second mode defined by the second dielectric channel waveguide (col. 2, lines 43-60). Furthermore, the reference teaches that the first and second tapered region narrow toward each other (fig. 1, ref. 22) and are graded in the horizontal and vertical directions.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have included a tapered coupler device as recited above in an optical chip to couple the low minimum bending radius dielectric waveguide to the large mode field size dielectric waveguide since one would be motivated to effective transition the first mode of the large mode field size dielectric waveguide to the second mode of the low minimum bending radius dielectric waveguide (col. 2, lines 43-60). Not only does such a coupler achieve this, but a tapered coupler also allows the coupling of light from waveguides having different specific geometries and materials, such as from various layers to one that has fewer layers, and all the while being able to have controlled coupling precision (col. 1, lines 26-40).

17. Claims 21-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA and Wojnarowski, in view of Carnevale et al. (U.S. Patent No. 4,412,722, from hereinafter "Carnevale").

AAPA and Wojnarowski disclose the optical chip as recited above with a low minimum bending radius dielectric waveguide (pg. 2, lines 15-17) having a high index core material. However, the references fail to specifically disclose a graded index region between the rough sides of the core and cladding to transition from high to low indices.

Carnevale discloses a low bend radius waveguide with a graded index region (abstract).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have included a graded index region between the rough sides of the core and cladding to transition from high to low indices since one would be motivated to minimize dispersion and therefore to maximize bandwidth (abstract). Furthermore, improved field confinement adds to the overall lower clad-to-core ratios, lower cabling, microbending, and curvature-induced losses (abstract), which all ultimately serve to information and date transmission of optical communication systems.

18. Claims 37-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA and Wojnarowski, in view of Joannopoulos et al. (U.S. Patent No. 5,955,749, from hereinafter "Joannopoulos").

AAPA and Wojnarowski disclose the optical chip as recited above with a second chip including an emitting/receiving optical device, which may also be an external large mode field size dielectric waveguide, to optically connect to the large mode size dielectric waveguide of the first chip, however, the references fail to specifically disclose the application of an anti-reflective coating on either of the waveguides.

Joannopoulos discloses an optical chip with waveguides that have anti-reflective coatings (col. 1, lines 46-48).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have applied anti-reflective coatings to the waveguides since one would be motivated to further reduces optical losses (col. 1, lines 46-48) during transmission between the waveguides.

Conclusion

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to George Y. Wang whose telephone number is 703-305-7242. The examiner can normally be reached on M-F, 8 am - 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert H. Kim can be reached on 703-305-3492. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

gw
March 13, 2003

ROBERT H. KIM
SUPERVISORY PATENT EXAMINER
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